VPU™ DEMONSTRATION MISSION
VICINITY PROCESSOR UNIT™ OVERVIEW

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ABSTRACT

Evolving Technologies Corporation is designing a new type of computer called a *Vicinity Processor Unit™ (VPU)*. The VPU is designed to monitor and control payloads using an operating system, control process and software environment that specifically takes into account the time delay associated with remotely controlling and monitoring a group of payloads in real time. This is a fundamentally different way of computing which has vast scientific implications for the design and implementation of data processing systems for future space flight missions.

As a demonstration misssion the VPU™ is expected to be flown aboard the Space Shuttle (Payload Identification No. G-700) as a part of NASA's Small Self-Contained Payloads (SSCP) Program. We believe this mission can greatly facilitate the development and validation of technology which may prove to be mission critical for many future space flight missions.

PAYLOAD DESCRIPTION AND MISSION OVERVIEW

Experiment Description:

The Vicinity Processing Unit™ (VPU) is composed of one or more microprocessors which has the ability to regulate or control one or more payloads either independently or in conjunction with an Earth based ground control site (i.e., Ground Support Equipment [GSE]) for normal operations of the respective payload(s).

Mission Overview

This mission is designed to be a demonstration mission which serves two purposes — to help validate the feasibility of the VPU concept and to identify areas for additional research. It is hoped that optimization of this demonstration mission will provide valuable scientific information and facilitate technological advances which could be readily incorporated into future space flight missions.

Specifically, we believe that we can demonstrate that an integral ground/vicinity control system, for remotely monitoring and managing of one or more experiments, can be conducted in "real time". i.e., the effective control of a remote experiment is not, per se, limited strictly by the time lag associated with transmission and processing time. More importantly, the load balancing features for the distribution of data processing in the operating system we are designing will largely be transparent to the design of the actual control system and software which operates the experiment.

To a degree which is not available today, the experimenters would be able to create a software program without having to be needlessly concerned with the effects of time lags. Of course there will be limits to how far this technology can be carried. It is our objective to demonstrate in actual fact that these limits lie well beyond what is commercially and economically achievable today. Even if such systems can only match the technical performance of conventional control systems it will still be cost effective because the cost of payload and software design will be considerably reduced.

MISSION OPERATIONS

Orbital Requirements & Payload Control Parameters

The nature of real time control from a remote location entails the need for telecommunications services between ground and experiment. For purposes of this demonstration mission we will select the control of sub payloads which only require a nominal level data being transferred. It has not been determined as to what telecommunications services is most suitable. As a minimum it is clear that telecommunications control can be achieved with low rate modem speeds.

Operational Requirements & Constraints

While there will be ground participation in the remote control of experiments, Shuttle Mission Specialists will only need access to Autonomous Payload Controller (APC) to start the experiment or otherwise interrupt its operations should it be required at any time during the mission.

The choice of experiments (sub assemblies of the GAS Can or other simple payloads associated with the mission) to be controlled by the VPU will be geared to address needs which will reflect operational requirements for an industrial strength implementation.